

CRNT-0022

9

PATENT

customer premise 106, Z_1 should be significantly greater than Z_4 , or effectively be made to be so to the data signal.

The magnitude of Z_1 is determined, for example, by the characteristic impedance of service line 113 and by the impedance of the load at customer premise 106. The
5 characteristic impedance of a cable is well known to those skilled in the art to be equal to $(L \times C)^{0.5}$, where L represents the unit inductance and C the unit capacitance of the cable. In buried underground power distribution cables, for example, this characteristic impedance is typically between 15 and 25 ohms. The load at customer premise 106 may vary significantly with wiring differences and other site-specific circumstances, but
10 typically is above 20 ohms. Therefore, generally, the overall impedance Z_1 may vary from 15 ohms to several hundred ohms.

The value of transformer impedance Z_1 depends upon various factors including the construction of distribution transformer 105. Also, it should be appreciated that impedance may be related to other electrical components in the electrical system, other
15 than the distribution transformer. As part of their everyday operation, power distribution transformers use windings and heavy iron cores to minimize power loss and safely handle large supply currents. These inherent characteristics of the transformer's construction create a potentially large composite winding capacitance. The large capacitance does not introduce problems, such as power loss, for traditional signals at lower frequencies, like
20 electrical power operating at 50 or 60 hertz (Hz). However, the large capacitance introduces significantly low impedance at higher frequencies, like 1 MHz to 100 MHz that may be used for transmitting data signals, for example. While internal series